

Listing of Claims

[including **(i)** amendments to Claims 20, 22, 25~27 and 29~41;
(ii) new Claims 42~48; and
(iii) status of all claims;
(Claims 20, 22, 25~27 and 29~48 are now active)]

1 ~ 19. (cancelled).

20. (currently amended) An apparatus for analyzing a multi-component gas mixture, comprising:

(a) an array of ~~four or more~~ chemo/electro-active materials, each chemo/electro-active material exhibiting a different electrical response characteristic, upon exposure at a selected temperature to the gas mixture, than each of the other chemo/electro-active materials;

wherein ~~at least four~~ of the chemo/electro-active materials in the array comprise one of the following groups of ~~four~~ materials:

-----the group of chemo/electro-active materials comprising, respectively, $\text{Ga}_a\text{Ti}_b\text{Zn}_c\text{O}_{n_1}$, $\text{Nb}_a\text{Ti}_b\text{O}_{n_2}$, $\text{Ni}_a\text{Zn}_b\text{O}_{n_3}$ and SnO_2

-----the group of chemo/electro-active materials comprising, respectively, $\text{Nb}_a\text{Ti}_b\text{O}_{n_4}$, $\text{Ni}_a\text{Zn}_b\text{O}_{n_5}$, $\text{Sb}_a\text{Sn}_b\text{O}_{n_6}$ and ZnO

-----the group of chemo/electro-active materials comprising, respectively, $\text{Ni}_a\text{Zn}_b\text{O}_{n_7}$, $\text{Sb}_a\text{Sn}_b\text{O}_{n_8}$, $\text{Ta}_a\text{Ti}_b\text{O}_{n_9}$ and ZnO ; and

the group of chemo/electro-active materials comprising, respectively, $\text{Sb}_a\text{Sn}_b\text{O}_x$, $\text{Ta}_a\text{Ti}_b\text{O}_x$, $\text{Ti}_a\text{Zn}_b\text{O}_x$, and ZnO_x ;

(i) the group consisting of SnO_x , ZnO_x , $\text{Nb}_a\text{Ti}_b\text{O}_x$, $\text{Ni}_a\text{Zn}_b\text{O}_x$, $\text{Ta}_a\text{Ti}_b\text{O}_x$, and $\text{Ti}_a\text{Zn}_b\text{O}_x$; or

(ii) the group consisting of SnO_x , ZnO_x , $\text{Sb}_a\text{Sn}_b\text{O}_x$, $\text{Ti}_a\text{Zn}_b\text{O}_x$, and $\text{Ga}_a\text{Ti}_b\text{Zn}_c\text{O}_x$; or

(iii) the group consisting of SnO_x , ZnO_x , $\text{Sb}_a\text{Sn}_b\text{O}_x$, $\text{Ta}_a\text{Ti}_b\text{O}_x$, and $\text{Ti}_a\text{Zn}_b\text{O}_x$; or

(iv) the group consisting of SnO_x , ZnO_x , $\text{Nb}_a\text{Ti}_b\text{O}_x$, $\text{Sb}_a\text{Sn}_b\text{O}_x$, $\text{Ta}_a\text{Ti}_b\text{O}_x$, $\text{Ti}_a\text{Zn}_b\text{O}_x$, and $\text{Ga}_a\text{Ti}_b\text{Zn}_c\text{O}_x$; or

(v) the group consisting of SnO_x , ZnO_x , $\text{Al}_a\text{Ni}_b\text{O}_x$, $\text{Mn}_a\text{Y}_b\text{O}_x$, $\text{Nb}_a\text{W}_b\text{O}_x$, $\text{Ta}_a\text{Ti}_b\text{O}_x$, and $\text{Nb}_a\text{Sr}_b\text{Ti}_c\text{O}_x$; or

(vi) the group consisting of Ce_aO_x , NbO_x , ZnO_x , $\text{Nb}_a\text{Ti}_b\text{O}_x$, $\text{Ni}_a\text{Zn}_b\text{O}_x$, and $\text{Ti}_a\text{Zn}_b\text{O}_x$; or

(vii) the group consisting of Ce_aO_x , NbO_x , ZnO_x , $\text{Al}_a\text{Ni}_b\text{O}_x$, $\text{Nb}_a\text{Ti}_b\text{O}_x$, and $\text{Ta}_a\text{Ti}_b\text{O}_x$;

wherein a, b and c are each independently about 0.0005 to about 1; and

wherein x is a number sufficient so that the oxygen present balances the charges of the other elements in the chemo/electro-active material;

(b) means for determining an individual electrical response of each chemo/electro-active material upon exposure of the array to the gas mixture; and

(c) means for obtaining, from ~~no information about the gas mixture other than~~ the individual electrical response of the chemo/electro-active materials, a determination related to the presence or concentration of a component in the gas mixture.

21. (cancelled).

22. (currently amended) An apparatus according to Claim 20 ~~or 21~~ wherein a chemo/electro-active material further comprises (i) one or more additives to promote adhesion of a chemo/electro-active material to a substrate; or that alter the conductance, resistance or selectivity of a chemo/electro-active material; or that catalyze the oxidation of a gas of interest or promote the selectivity for a particular analyte gas; and/or (ii) one or more dopants that convert an n semiconductor to a p semiconductor, or vice versa.

23 ~ 24. (cancelled).

25. (currently amended) An apparatus according to Claim 20 ~~or 21~~ wherein component (c) determines the presence or concentration of a nitrogen oxide and a hydrocarbon in the multi-component gas mixture.

26. (currently amended) An apparatus according to Claim 20 ~~or 21~~
wherein component (c) obtains a determination from gases in the gas mixture
that are not separated.

27. (currently amended) An apparatus according to Claim 20 ~~or 21~~
wherein component (b) determines electrical responses of the chemo/electro-
active materials upon exposure to only the multi-component gas mixture.

28. (cancelled).

29. (currently amended) An apparatus according to Claim 20 ~~or 21~~
wherein the multi-component gas mixture is emitted by a process, or is a
product of a chemical reaction that is transmitted to a device, and wherein the
apparatus further comprises means for utilizing the electrical responses for
controlling the process or operation of the device.

30. (currently amended) A vehicle for transportation comprising an
apparatus according to Claim 20 ~~or 21~~.

31. (currently amended) Equipment for construction, maintenance
or industrial operations comprising an apparatus according to Claim 20 ~~or 21~~.

32. (currently amended) An apparatus according to Claim 20 ~~or 21~~
further comprising heating means for separately heating each chemo/electro-
active material.

33. (currently amended) An apparatus according to Claim 20 or 21
32 wherein each chemo/electro-active material is heated to the same
temperature.

34. (currently amended) An apparatus according to Claim 20 or 21
32 wherein one or more chemo/electro-active materials has a different
temperature than the other chemo/electro-active materials.

35. (currently amended) An apparatus according to Claim 20 or 21
wherein the chemo/electro-active materials are on a substrate made from a
material selected from the group consisting of silicon, silicon carbide, silicon
nitride, and alumina with a resistive dopant.

36. (currently amended) An apparatus according to Claim 20 or 21
wherein component (c) obtains a determination as to the presence or
concentration in the gas mixture of an organo-phosphorus gas.

37. (currently amended) An apparatus according to Claim 20 or 21
which is characterized by a size such that it may be held in the human hand.

38. (currently amended) A ventilation system for a car or building
comprising an apparatus according to Claim 20 or 21.

39. (currently amended) An apparatus according to Claim 20 ~~or 21~~ wherein component (c) determines the presence or concentration of a nitrogen oxide in the multi-component gas mixture.

40. (currently amended) An apparatus according to Claim 20 ~~or 21~~ wherein component (c) determines the presence or concentration of a hydrocarbon in the multi-component gas mixture.

41. (currently amended) An apparatus according to Claim 20 ~~or 21~~ wherein component (c) determines the presence or concentration of ammonia in the multi-component gas mixture.

42. (new) An apparatus according to Claim 20 which comprises the group of materials consisting of SnO_x , ZnO_x , $\text{Nb}_a\text{Ti}_b\text{O}_x$, $\text{Ni}_a\text{Zn}_b\text{O}_x$, $\text{Ta}_a\text{Ti}_b\text{O}_x$, and $\text{Ti}_a\text{Zn}_b\text{O}_x$.

43. (new) An apparatus according to Claim 20 which comprises the group of materials consisting of SnO_x , ZnO_x , $\text{Sb}_a\text{Sn}_b\text{O}_x$, $\text{Ti}_a\text{Zn}_b\text{O}_x$, and $\text{Ga}_a\text{Ti}_b\text{Zn}_c\text{O}_x$.

44. (new) An apparatus according to Claim 20 which comprises the group of materials consisting of SnO_x , ZnO_x , $\text{Sb}_a\text{Sn}_b\text{O}_x$, $\text{Ta}_a\text{Ti}_b\text{O}_x$, and $\text{Ti}_a\text{Zn}_b\text{O}_x$.

45. (new) An apparatus according to Claim 20 which comprises the group of materials consisting of SnO_x , ZnO_x , $\text{Nb}_a\text{Ti}_b\text{O}_x$, $\text{Sb}_a\text{Sn}_b\text{O}_x$, $\text{Ta}_a\text{Ti}_b\text{O}_x$, $\text{Ti}_a\text{Zn}_b\text{O}_x$, and $\text{Ga}_a\text{Ti}_b\text{Zn}_c\text{O}_x$.

46. (new) An apparatus according to Claim 20 which comprises the group of materials consisting of SnO_x , ZnO_x , $\text{Al}_a\text{Ni}_b\text{O}_x$, $\text{Mn}_a\text{Y}_b\text{O}_x$, $\text{Nb}_a\text{W}_b\text{O}_x$, $\text{Ta}_a\text{Ti}_b\text{O}_x$, and $\text{Nb}_a\text{Sr}_b\text{Ti}_c\text{O}_x$.

47. (new) An apparatus according to Claim 20 which comprises the group of materials consisting of Ce_aO_x , NbO_x , ZnO_x , $\text{Nb}_a\text{Ti}_b\text{O}_x$, $\text{Ni}_a\text{Zn}_b\text{O}_x$, and $\text{Ti}_a\text{Zn}_b\text{O}_x$.

48. (new) An apparatus according to Claim 20 which comprises the group of materials consisting of Ce_aO_x , NbO_x , ZnO_x , $\text{Al}_a\text{Ni}_b\text{O}_x$, $\text{Nb}_a\text{Ti}_b\text{O}_x$, and $\text{Ta}_a\text{Ti}_b\text{O}_x$.